

Three Implementations of Phononic Energy in a Unified System for Cryo-Phononic Materials Disassembly and Segregation

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Simon Edwards

Research Acceleration Initiative

Introduction

Rare-Earth Elements (REEs) are oftentimes highly difficult to refine due to difficulty in segregating these elements from other collocated elements with nearly identical properties. Smelting is an energy-intensive process that must be conducted at centralized facilities, requiring the shipment of heavy materials at extreme costs to these facilities. While new mines may be opened in virtually any location, for smelting to be practical, discrete smelting plants are traditionally built upon the site of REE mines.

A model based upon larger numbers of mines and quarries may enable us to obtain the necessary quantities of REEs to meet our national demand, but the use of smelting for elemental separation would make this process prohibitively expensive if the number of smelting facilities were increased by tenfold the current number, which is currently estimated to be a conservative projection of what would be required.

There is now sufficient demand for experimental elemental segregation processes that could augment or replace smelting that alternative methods of REE refinement are now deserving of significant research and development investment.

Abstract

Vibrational energy has a multiplicitous functionality as a vector for exerting mechanical force on physical objects, a generator of heat energy and as a *guide* for thermal energy, amongst other applications. Phonons can bring about the mechanical movement of atoms or objects, can generate heat and can even be used creatively in order to shunt heat away from objects that one might wish to keep cool, as in the case of phononically-cooled reverse piezoelectric material-doped semiconductors (PC/RPM-DS.)

By utilizing the same principles as in one of the alluded-to self-cooling processor units, bulk quantities of earth extracted from a REE mine may be cooled using the controlled introduction and conduction of acoustic energy into batches of earthen material that can cool the earth and the REEs contained therein to temperatures that cause them to become brittle using less energy than would be required to melt the metals.

Once cooled, more intense acoustic energy could be used to generate sweeping shearing force lines to sever the molecular bonds between atoms to achieve an

atomic granularity of the whole of the material in the batch. Phononic energy of yet another pattern could then be used to cause the elements to settle in layers according to their weight to enable simplified elemental segregation.

Essential to being able to cool bulk objects using acoustic energy is the ability to externally control the direction of flow of projected acoustic energy. Energy must be first focused toward the center of cubical batches of material and then redirected toward the periphery of those bodies through a series of turns at right-angles. These pathways would alternate, as in the self-cooling processor units, between an A schema and a B schema that would ensure both the continued flow of thermal energy outward toward the periphery of the body to be cooled as well as ensuring the counteraction of the many-pendulums effect that causes nuclear vibration to act as heat rather than as sound.

It is only through the counteraction of the many-pendulums effect of nuclear oscillation that heat energy may be converted into a less-organized form that may be carried away by carefully-structured phononic energy that would otherwise contribute to heat rather than eliminating it. Poetically, just as physical material that is chilled becomes brittle and breaks apart easily, disorganized heat energy is similarly more easily separated from the matter to which it would ordinarily be tethered.

By first disrupting the organizational synchronization of heat energy, itself, it may be possible to shunt that heat energy away from physical matter using acoustic energy to generate cryogenic effects which can ultimately be leveraged to enable us to more easily separate strongly bond physical matter.

Conclusion

While this initiative would require innovation in the area of acoustic energy transference and would require that relatively narrow phononic heat-conveyor lines be generated, the use of fluidic conduction mediums and ultra-focused concave acoustic projector systems would be the rational starting point for the development of such a system.

Beyond ore refinement, this would also have application for recycling.